

Lunar Librarian Newsletter October 2007

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LRO News



LRO and SDO Propulsion Modules in "Big Top" clean tent at Goddard Space Flight Center.

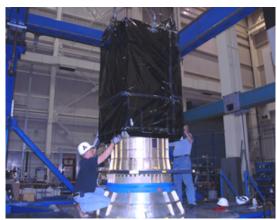
October 25, 2007 - The Lunar Reconnaissance Orbiter (LRO) propulsion module (left side of photo) completed its proof pressure testing and sharing the "Big Top" clean tent with the Solar Dynamic Observatory (SDO) propulsion module. Work is continuing on the heater circuits, this will prevent the fuel from freezing during flight.

The Power System Electronics (PSE) is in the vibration laboratory. This test will ensure that the box can handle the rigors of riding on a rocket.

October 12, 2007 - The LRO team completed the last of over 200 welds on the propulsion module. We will now pressurize the system and check for leaks. After this proof pressure testing, we need to finish wiring the heaters and thermostats, and then we will perform a shake test.

The spacecraft bus structure is undergoing testing in the static loads facility. We will pull on parts of the spacecraft to ensure that all the joints can handle the stresses induced by the forces of the launch environment. The flight C&DH box is completely assembled and we are preparing for a thermal test.

Follow LRO's assembly progress at: http://lunar.gsfc.nasa.gov/hardware.html



Spacecraft Bus moved to Static Loads Facility for Structural Qualification Load Test

Lunar News

This month marks the launch of the second international mission to the Moon, this time by China. Chang'e-1 is the first of three Chinese missions to the Moon. Launched October 24, 2007, Chang'e is a lunar orbiter like LRO.



The Chang'e-1 mission has four objectives. The first three are directly related to the Moon itself. The objectives are:

- 1. To 'draw' pictures of the Moon and obtaining 3-D images of the lunar surface. The drawings will consist of initially making an outline of the geology and structures (landforms) to provide a guide for potential soft landing sites in the future. Chang'e-1's orbit will allow for complete mapping of the Moon surface including the north and south polar regions
- 2. To investigate the composition of the lunar surface by looking at the number of chemical elements present and their distribution. The location of the useful elements will be mapped.
- 3. To probe the regolith (lunar soil) to examine its depth and the amount of helium-3 present.
- 4. To examine the space environment between the Earth and the Moon. Also to study the impact of solar activity on both the Earth and the Moon.

Onboard Chang'e-1 there is six instruments:

- CCD Stereo Camera for creating a 3-D image of the lunar surface
- Interferometer Spectrometer Imager for obtaining images using multi-spectral remote sensing
- Laser Altimeter for acquiring elevation data
- Gamma/X-Ray Spectrometers for obtaining information on different lunar elements
- Microwave Detector for determining lunar soil depth
- Space Environment Monitor System for measuring particles in the solar wind
 - High-Energy Solar Particle Detector
 - Low-Energy Ion Detector

For more information please visit:

http://solarsystem.nasa.gov/missions/profile.cfm?Sort=Target&Target=Moon&MCode=CHANGE1

NASA News

Dawn launches at dawn



On September 27, 2007, Dawn was launched on top of a Delta II rocket. Its destination is the asteroid belt, located between Mars and Jupiter. Dawn is NASA's ninth Discovery mission.

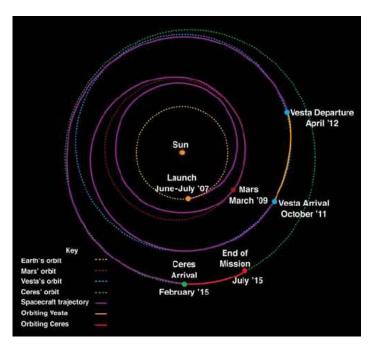
With this mission, scientists hope to gain a better understanding of the

formation and the evolution of our Solar System. During the mission, Dawn will orbit two protoplanets, Ceres and Vesta.

As Ceres evolved, it was kept cool by water.

Evidence of this can be found in the surface in the form of frost or vapor. There is also a possibility that there is liquid water under the surface. Vesta's evolution is quite different than Ceres'. It is believed that Vesta was once hot and violent. This caused its interior to be melted and the surface to be dry.





Dawn will measure the mass, shape, volume, spin rates, and gravity of both of these protoplanets. By looking at the elements and mineral composition, scientists hope to determine their thermal history and evolution.

Here's what you can expect to happen with Dawn over the lifetime of the mission:

Dawn Mission Timeline	
Launch	September 27, 2007
Mars gravity assist	February 2009
Vesta arrival	August 2011
Vesta departure	May 2012
Ceres arrival	February 2015
End of primary mission	July 2015

For more information on Dawn, please visit http://dawn.jpl.nasa.gov/

Science News

NASA Science News has published several articles last month. Please follow the links to read the full stories. Check out our RSS feed at http://science.nasa.gov/rss.xml!



Cave Skylights Spotted on Mars

NASA's Mars orbiters have spotted "skylights" apparently leading to cavernous underground spaces on Mars. The discovery is fueling interest in potential underground habitats and sparking searches for caverns elsewhere on the Red Planet. http://science.nasa.gov/headlines/y2007/21sep_caves.htm?list907815

Blasting a Hole in a Comet: Take 2

Two years ago, NASA's Deep Impact spacecraft blasted a hole in Comet Tempel 1, offering researchers their first look inside a comet. One small problem: The cloud of debris was so thick no one could clearly see the crater. But now the dust has cleared and another NASA spacecraft is returning to the scene to examine the hole Deep Impact wrought. http://science.nasa.gov/headlines/y2007/26sep_next.htm?list907815

Voyage to the Giant Asteroids--Liftoff!

NASA's Dawn spacecraft has left Earth on a mission to explore the mysterious giant asteroids Ceres and Vesta. Today's Science@NASA story explains some of the scientific reasons for making the trip. http://science.nasa.gov/headlines/y2007/27sep_dawn2.htm?list907815

A New Lunar Impact Telescope

Researchers from the Marshall Space Flight Center have built a new "lunar impact" observatory in rural north Georgia. They're using it for their own cutting edge research and sharing the facility with local middle-and high-school students. http://science.nasa.gov/headlines/y2007/28sep_wco.htm?list907815

Cool video: The Sun Rips off a Comet's Tail

Earlier this year, Comet Encke was passing a little too close to the Sun when a coronal mass ejection (CME) hit the comet and ripped off its tail. NASA's STEREO spacecraft was watching and recorded a must-see movie featured in today's story. http://science.nasa.gov/headlines/y2007/01oct_encke.htm?list907815

Tones from Deep Space

Fifty years after the launch of Sputnik kicked off the Space Age, an ultra-modern probe heading for Pluto is using retro Sputnik-like tones to communicate with Earth.

http://science.nasa.gov/headlines/y2007/04oct_beaconmonitor.htm?list907815

Giant Atmospheric Waves Sighted Over Iowa

Last week, cameras in Iowa captured a giant atmospheric wave passing over Des Moines--see the movie in today's story. Atmospheric scientists believe these waves, called undular bores, may be more common and important than previously thought.

http://science.nasa.gov/headlines/y2007/11oct_undularbore.htm?list907815

New Lakes Discovered on Titan

The Cassini spacecraft has discovered three new lakes near the south pole of Saturn's moon Titan. These strange bodies are filled not with water but liquid methane and ethane. Researchers are also studying a lake near Titan's north pole larger than Lake Superior.

http://science.nasa.gov/headlines/y2007/12oct_titan.htm?list907815

Librarian News



Welcome to Fall! What programs are you planning for the fall? Drop us an email and let us know!

Welcome Return to the Moon Educators!!

This month, Stephanie Stockman and I traveled out to NASA Ames Research Center to present at a "Return to the Moon" workshop for museum educators. The workshop was hosted by the LCROSS education team at Ames Unlike our librarian workshops, this workshop was 1.5 days and we gave a brief overview of some of the activities many of you did in our workshops. Stephanie did a presentation about LRO, and Brian Day the EPO lead for LCROSS talked about spectroscopy and the LCROSS mission.

Did you know?? Where can I find??

What's happening at some of the NASA Centers:

AMES Astrograms

http://www.nasa.gov/centers/ames/astrogram/2007/07astrograms.html

Glenn Research Center ~ Aerospace Frontiers

http://www.nasa.gov/centers/glenn/news/AF/index.html

Goddard ~ Goddard View

http://www.nasa.gov/centers/goddard/news/gnews_detail.html

Langley ~ **Researcher News**

http://www.nasa.gov/centers/langley/news/researchernews/index.html

Stennis ~ **Lagniappe**

http://www.nasa.gov/centers/stennis/news/publications/index.html

Links of the Month...

- NASA Celebrates 50 years! Check out what has happened over the past half century. http://www.nasa.gov/50th
- Lunar CRater Observation and Sensing Satellite (LCROSS) home page. http://lcross.arc.nasa.gov/
- "What's the Difference" is a highly accessible and a simple to use "compare and contrast" tool for students. It is easily customizable to go well beyond the included module that covers the Solar System. http://learn.arc.nasa.gov/wtd/index.html
- NOAA's Teacher at Sea Program: A Free Teacher Research Experience http://teacheratsea.noaa.gov

Monthly Lunar Activity

Comparing Soils found on Earth and the Moon

Activity taken from: Hawai'i Space Grant College, Hawai'i Institute of Geophysics and Planetology, University of Hawai'i, 1996 http://www.spacegrant.hawaii.edu/class_acts/MoonDoc.html

Background

The loose, fragmental material on the Moon's surface is called **regolith**. This regolith, a product of **meteoritic bombardment**, is the debris thrown out of the **impact craters**. The composition and texture of the lunar regolith varies from place to place depending on the rock types impacted.

Generally, the older the surface, the thicker the regolith. Regolith on young maria may be only 2 meters thick; whereas, it is perhaps 20 meters thick in the older lunar highlands.

By contrast, regolith on Earth is a product of **weathering**. Weathering encompasses all the processes that cause rocks to fragment, crack, crumble, or decay. These processes can be *physical* (such as freezing water causing rocks to crack), *chemical* (such as decaying of minerals in water or acids), and *biological* (such as plant roots widening cracks in rocks).

The rock debris caused by weathering can then be loosened and carried away by **erosional** agents -- running water (fast-flowing rivers, rain, ocean waves), high-speed wind (by itself or sandblasting), and ice (glaciers).

In this activity, procedures A and B challenge the students to determine the effects of wind, sandblasting, and water on regolith formation and deposition on Earth. This is followed by procedure C in which the students simulate regolith formation on the Moon by meteoritic bombardment.

Materials

- toasted white bread
- toasted golden wheat bread
- small pan
- sand paper, nail file, or edge of ruler
- ice cube with sand inside
- tray
- fist-size rock

Notes

Toast, crackers, or brittle cookies can be used in this activity. Toast is the least expensive but most time consuming choice. In any case, students will need two different colors of materials for procedure C; for example, vanilla and chocolate graham crackers. Invariably, students get hungry at the sight of food, so you may want to reserve some clean materials for consumption or use something other than a rock for the projectile.

To prepare bread: use a conventional oven, toaster, or sun-dry method to produce the most crisp and brittle toast. Toast one loaf of white bread and one loaf of golden wheat or rye bread. Note that whole wheat bread does not get brittle enough.

For procedure B, fill margarine containers (one for each group) with water and sand, then freeze. The more sand, the better the illusion to a real rock.

For procedure C, do not use glass pans. Large plastic tubs are preferred for this procedure, but recyclable aluminum roasting pans or shallow cardboard boxes work as well.

Regolith Formation on Earth

Procedure A

What effect does wind have on regolith formation?

- 1. Imagine that the piece of toasted bread is a rock on Earth. Your hand is the wind. The sand paper is wind carrying particles of sand.
- 2. Predict the effects of rubbing just your hand and then the sand paper across the toasted bread.
- 3. Now try it. Rub your hand across the toasted bread and observe the bread the pieces which fall from it onto the pan. Observations:
- 4. This time, rub the sand paper across the toasted bread and observe the bread and the pieces which fall from it onto the pan. Observations:
- 5. How was the effect different?
- 6. How is this activity related to processes on Earth?

Procedure B

What effect does falling or fast flowing water have on regolith formation?

- 1. Imagine that the ice cube with sand is a rock.
- 2. Place this ice cube on a collection tray beneath the water faucet.
- 3. Adjust the water flow from the faucet so a medium stream hits the ice cube.
- 4. Observe what happens to the ice cube and the remaining particles.
- 5. What happened to the rock (ice cube)?
- 6. Describe the particles which remain.

7. How does water contribute to regolith formation on Earth?

Regolith Formation on the Moon Procedure C

- 1. Do you think regolith on the Moon is formed in the same manner as on Earth? Why or why not?
- 2. Now we will investigate the effects of meteoritic bombardment on regolith formation.
- 3. In a small pan, place 2 slices of toasted white bread onto 3 slices of toasted golden wheat bread. This represents the Moon's crust.
- 4. Drop a rock onto the layers of toasted bread twice. Describe the bread slices and the crumbs.
- 5. Drop the rock 20 times onto the layers of toasted bread. Describe the bread slices and the crumbs.
- 6. Which crumbs can be seen at the surface? Why?
- 7. How does the thickness of the crumb layers compare after 2 hits and after 20 more hits?
- 8. How does meteoritic bombardment make regolith on the Moon?